ORIGINAL

EX PARTE OR LATE FILED

REDACTED -- FOR PUBLIC INSPECTION

August 20, 2002

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW – Room TW-A325
Washington, D.C. 20554

Re: Ex Parte Notice – Consolidated Application of EchoStar Communications Corporation, General Motors Corporation and Hughes Electronics Corporation for Authority to Transfer Control, CS Docket No. 01-348

Dear Ms. Dortch:

In accordance with Section 1.1206 of the Commission's Rules, 47 C.F.R. §1.1206, EchoStar Communications Corporation, Hughes Electronics Corporation and General Motors Corporation, Applicants in the above-referenced merger proceeding, submit this redacted version of highly confidential materials filed on August 19, 2002,[1] in support of the competitive effects analysis that has been submitted previously by the Applicants in connection with the proposed merger.

An original and one copy of this *ex parte* notice (and two copies of the attachment) are being filed with the Commission. If you have questions concerning this notice, please do not hesitate to contact the undersigned.

Respectfully submitted,

Gary M. Epstein /CN
Gary M. Epstein
James H. Barker
Latham & Watkins
555 11th Street, N.W.
Suite 1000
Washington, D.C. 20004
(202) 637-2200

Counsel for Hughes Electronics Corporation and General Motors Corporation

Pantelis Michalopoulos /CN
Pantelis Michalopoulos
Carlos M. Nalda
Steptoe & Johnson LLP
1330 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 429-6494

Counsel for EchoStar Communications Corporation

Attachment
cc (w/ att.): Marcia Glauberman
Linda Senecal

No. of Copies rec'd 0+1
List ABCDE

[1] *See* Letter to Marlene H. Dortch from Pantelis Michalopoulos, *et al.*, CS Docket No. 01-348 (dated August 19, 2002).

MEMORANDUM

TO: **Federal Communications Commission**

FROM: Dr. Robert Willig

DATE: August 19, 2002

RE: Backup Materials for July 2, 2002 Presentation on the Competitive Effects of the EchoStar-Hughes Merger

We hereby produce the following information in support of the competitive effects presentation[1]:

1. A revised paper describing the merger simulation methodology and results in detail. This paper provides additional details to the descriptions submitted in July. The document is titled "The EchoStar-Hughes Merger Simulation: Technical Notes" ("Technical Notes").[2]

2. A series of files (Mathematica programs and Excel workbooks) used to generate the simulation results described in the above paper. These files are contained in the following folders: *Unscaled_flat*, *Unscaled_div[ ]*, *Unscaled_div[ ]*, *Unscaled_div[ ]*, *Scaled_flat*, *Scaled_div[ ]*, *Scaled_div[ ]*, *Scaled_div[ ]*, and *Utilties*. Additional relevant files are titled *Unscaled_Welfare_Spreadsheet.xls*, and *Scaled_Welfare_Spreadsheet.xls*. These files are described in Technical Notes, which also contains instructions on how to use them in order to replicate the merger simulation analysis.

3. An Excel workbook (*ChurnTracker_SummaryTables.xls*) that includes diversion rates from DIRECTV to other service providers for each month between January 2000 and March 2002). These tables summarize the data in DIRECTV's Churn Tracker survey. The methodology used to construct these tables from the raw data in the Churn Tracker survey is described in *DIRECTV Churn Tracker Usage.doc* included in this production. Both files are in the folder titled *Churn Tracker Information*. The same folder also contains two Excel files with supplemental subscriber data used in our analysis. These two files supplement the Churn Tracker data production on July 12, 2002.

Furthermore, this submission includes the following additional backup information.

---

[1] We have already presented extensive backup materials for our presentations to the Federal Communications Commission (FCC) on July 2, 2002 regarding the competitive effects of the EchoStar-Hughes merger. Specifically, we have presented the following categories of materials: (1) We have provided several descriptions of the methodology used to produce the merger simulation. In conjunction with the July 2nd presentation, we submitted a technical appendix providing additional information about our methodology and a list of data sources. (*See* "Notes on EchoStar-DIRECTV Merger Simulation Analysis Methodology" and "Sources for Competitive Effects /National Pricing Presentation," *ex parte* notice filed July 5, 2002, CS Docket 01-348.) On July 25th, we produced an 18-page paper titled "Supplemental Technical Appendix to The Presentation on The Competitive Effects of The EchoStar-DIRECTV Merger" which describes in further detail the simulation methodology that we employed. (*Ex parte* notice filed July 25, 2002, CS Docket 01-348.) (2) We produced the computer programs used to calculate regression results used in the competitive effects presentation on July 12th. (*Ex parte* notice filed July 12, 2002, CS Docket 01-348.) Associated data were also produced on July 12th and on July 25th.

[2] While we have tested the sensitivity of our results by using several diversion rates in the [ ] percent range (as described in the Technical Notes), we believe that the actual diversion rate is in the low end of this range.

a. Paper by N.S. Cardell. We have updated the reference to a 1997 issue of the *Econometric Theory* journal. The complete reference is in the reference section of the Technical Notes. A copy of this paper is included in this production.

b. Backup materials for attempts to produce instrumental variables estimates for the DBS nest parameter ("sigma"): The folder *Sigma_IV* included in this production contains a STATA *do* file *IVs_for_sigma.do,* that implements an IV estimation for the nest parameter using local service as an IV. The log file produced from this program, *IVs_for_sigma.log,* is also included. The *READ_ME.txt* file describes how to use these programs.

c. Formulas and program used for calculating nest parameter ("sigma"): The formula is provided in Section 1 and in Addendum 2 of Technical Notes. The spreadsheet used for calculating the value of the nest parameter, *Sigma_Calculator.xls*, is included in the "*Utilities*" folder. (This file also contains instructions for users.)

REDACTED – FOR PUBLIC INSPECTION

THE ECHOSTAR-HUGHES MERGER SIMULATION: TECHNICAL NOTES

Dr. Robert Willig
Princeton University

August 19, 2002

INTRODUCTION

On July 2, 2002, we presented our analysis of the unilateral competitive effects associated with the EchoStar-Hughes merger. In conjunction with that presentation, we submitted a technical appendix providing additional information about our methodology.[1] In addition, a supplemental technical appendix with further details about simulation data and methodology was filed on July 25, 2002.

In this paper, we further explicate the nested logit demand function methodology utilized to simulate unilateral effects of the proposed merger on competition in MVPD services. We also employ a flat logit demand model to simulate the merger. Since the flat logit is a special case of the nested logit, we focus on further detailing the nested logit model here. We describe in detail the methodology, the data used to implement the merger simulation, and the results. In summary, we find that the proposed merger will produce very large consumer welfare benefits – potentially in excess of $1 billion per year. Even under extremely conservative assumptions, we find that consumers will benefit from the merger of EchoStar and Hughes.

As discussed in our previous submissions, the simulation methodology can best be described as a sequence of three steps: We first specify a nested logit model of demand and estimate/calibrate the relevant parameters. Marginal costs are inferred from demand and past choice of prices. Step 1 is described in Section 1 of this paper.

Next, the demand and cost estimates produced in Step 1 are utilized to simulate the price and welfare effects resulting from the merger. We simulate changes in DBS prices assuming that EchoStar and DIRECTV maximize joint profits after the merger, in the context of a Bertrand-Nash equilibrium. We also simulate the equilibrium reactions by cable operators. Step 2 is described in Section 2.

[1] Competitive Effects Technical Appendix, CS Docket No. 01-348 (filed July 3, 2002).

To calculate the net consumer welfare effects of a merger, applicable merger-specific efficiencies need to be modeled as well. Because the proposed merger will result in substantial merger-specific efficiencies, the final step in our analysis involved incorporating the consumer welfare benefits of such efficiency gains. Specifically, we estimate the welfare benefits of the merger-specific marginal cost reductions and the expansion of local service ("LIL") to all 210 Designated Market Areas (DMAs). Step 3 is described in Section 3.

In the final section of this paper, we summarize the results from the simulation of the proposed EchoStar-Hughes merger.

SECTION 1: ESTABLISHING DEMAND AND COST PARAMETERS

In this section, we first describe a standard, flexible model of consumer preferences, market demand, marginal costs, and firm conduct. We then detail how we estimate/calibrate the appropriate demand and cost parameters to allow the model to capture the specifics of the cable franchise areas at issue. Finally, we compare demand elasticities implied by the nested logit model with elasticities estimated in the literature on MVPD demand. We find that our elasticity estimates are comparable to those estimated by Goolsbee and Petrin (2002) and others.

Before we describe the nested logit model of demand that we estimate (and which we then use to measure the welfare effects of the merger), we note that the reason for using such a structural model of demand is that available data do not permit a simpler direct estimate of elasticities of demand for MVPD products. As noted in our presentation, DBS monthly fees are national and change only slightly over time. DIRECTV and EchoStar changed monthly fees only three times combined between 1999 and 2001 – and the price changes were relatively small ([ ]). Thus, there is only limited cross-sectional and intertemporal variation in monthly fees in the data. While Pegasus charges higher fees for DIRECTV's service, econometrically exploiting such price variation is of limited value because differences in monthly fees between DIRECTV and Pegasus areas are highly correlated with other differences between these two types of regions. That is, Pegasus serves mainly rural areas; even a cursory examination of DBS share trends in rural areas suggests that they differ quite sharply from those in more urban areas, indicating quite different dynamics in the two areas, which makes it difficult to separate such confounding factors from the effects of small price differentials.

Nonetheless, we attempted to use the available variation in DBS programming fees to estimate DIRECTV and EchoStar demand elasticities. We constructed a monthly zip code level dataset (Jan. 1998-March 2002) with 1.1 million observations. Using these data, we estimated several reduced-form panel data models. As dependent variables, we tried the following measures: shares of DIRECTV and EchoStar, log of their market shares, change in their market shares, and change in log of their market shares. As control variables we used the following variables: DIRECTV and EchoStar monthly fees, DBS characteristics (such as whether or not local service is offered), controls for seasonal changes in demand, time trend variables (such as year dummies, time trend, log of time trend, time trend squared, and various interactions of trends and market characteristics), demographics (average income, percent of housing units that are rented, percent of singles in population, percent of houses that are single unit dwellings, population density, average household size, and state unemployment rate), and cable characteristics (monthly cable fee, dummies for top MSOs, cable channel capacity, and number of premium channels offered).

We found that all regressions, with the exception of the regression on changes in EchoStar market shares (or logs of shares), obtain the wrong sign for at least one price coefficient. The coefficients are generally statistically significant, and are invariant to inclusion of cable characteristics and zip code fixed effects. The coefficients on the specification that yields the theoretically expected signs imply an EchoStar own price elasticity of [ ] (after two years). But in this system, both DBS firms' diversion ratios obtain the wrong sign since the coefficients on the parallel DIRECTV regression have the wrong sign for both price coefficients.[2]

The lack of variation in DBS monthly fees (the largest component of any measure of DBS "price") suggests the employment of structural models, such as the logit demand model, that can econometrically exploit the substantial cable price variation across franchise areas,

---

[2] The data used for these analyses were produced to the FCC on July 25th as part of the backup materials to the competitive effects presentation. The STATA programs used to calculate the results referred to here (and the log files generated, which contain summary statistics of all variables) were produced to the FCC on July 12th. Note that the STATA code (in *monthly_zip_code_data_regs.do*) and the 81-page log file (in *monthly_zip_code_data_regs.txt*) produced cover 48 separate regression specifications and their output.

and can be calibrated with additional data. Thus, we employ a nested logit demand framework.

I. Model

Assumptions about Demand

Each consumer selects a single service from several options. Grouping (or "nesting") some of these products together allows us to focus on the degree of substitutability between two products. Following the literature on discrete choice demand modeling (e.g., Berry (1994)), we assume that the utility of representative consumer k, from consuming choice j is $u_{kj} = \Delta_j + \eta_{kg} + (1-\sigma)\varepsilon_{kj}$. (For convenience, we suppress the subscript for time and geographical area.) Here, the mean utility of product j is $\Delta_j = x_j\beta + \alpha p_j + \xi_j$; the consumer and product specific variations in utilities, ε_{kj}, are modeled as *iid* Type I extreme value error terms; η_{kg} is a group specific error that captures shocks common to choices within the same group (nest) g (*i.e.*, for consumer k, η_{kg} is common over all products in g, allowing a positive covariance in taste across products within group g); x_j is a vector of measured non-price characteristics of choice j; p_j is the price of choice j; and ξ_j may be interpreted as the average utility associated with unmeasured product quality characteristics. Both ε_{kj} and $\eta_{kg} + (1-\sigma)\varepsilon_{kj}$ are assumed to be distributed Type I extreme value. The assumption that errors have an extreme value distribution gives rise to the familiar logit form of demand. Note that the parameter σ, which has values between 0 and 1, should be interpreted as measuring the strength of the nest (with higher values of σ corresponding to a stronger nest and hence higher correlation of consumer tastes within the nest). As $\sigma \to 0$, within group correlation goes to zero (shocks to utility become *iid*); when σ =0, the model reduces to a flat logit.[3]

[3] Cardell (1997) describes nested logits in terms of the utility framework described here. As noted in Berry (1994), this type of decomposition implies the conclusion that as $\sigma \to 0$, within group correlation goes to zero. This result stems from the fact that the variance of η_{kg} is a function of σ. When σ=0, the variance of η_{kg} equals 0, and η_{kg} becomes a constant.

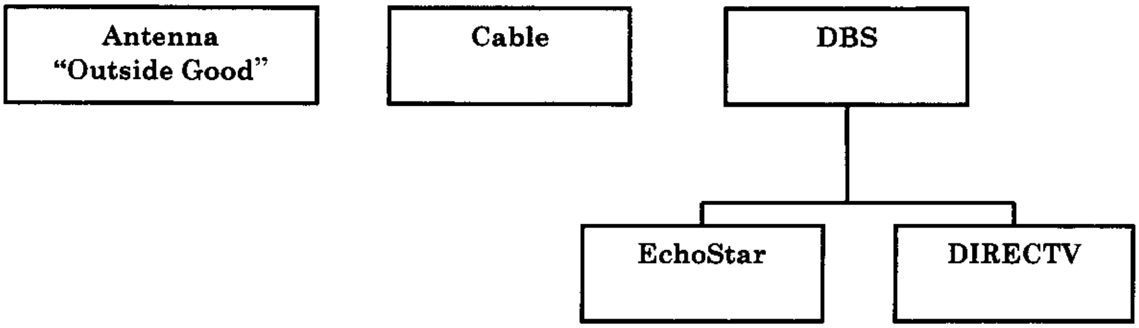
We assume that consumers face the following choices: cable, EchoStar, DIRECTV and antenna (*i.e.*, not purchasing any MVPD product).[4] We allow for the possibility that consumers with a preference for DIRECTV are more likely to consider EchoStar to be their second choice (and *vice-versa*) relative to their market shares by placing the two products in a "DBS nest."[5] Since we allow for the possibility that the nest parameter we use is greater than zero, our modeling approach is conservative in that it potentially produces higher cross elasticities between the two DBS choices (and hence, higher price increases following the merger) than those that would be predicted by the use of a flat logit model alone. The choices facing consumers in our nested logit model are illustrated in Figure 1.[6]

[4] Note that specifying "antenna" as a choice does not imply that antenna is part of the "relevant market," in the sense of the Merger Guidelines. While the churn data from both EchoStar and DIRECTV suggest that more DBS consumers view antenna as a "second choice" than the other DBS provider, which implies that antenna should be included in the relevant product market, we do not take a position on this issue here.

[5] In fact, the churn data we have examined show that cable is by far the next best choice for subscribers to each DBS provider. The proportion of subscribers leaving one DBS provider to subscribe to the other is dwarfed by the proportion of subscribers leaving that DBS provider for cable.

[6] In a flat logit model, the DBS "nest" does not exist, and EchoStar and DIRECTV are choices at the same level as cable and antenna.

Figure 1



The utility function described above implies the following demand system[7]:

For cable demand in geographical area i: Eq. (1):

$$\ln(CableShare / AntennaShare)_i = \delta_{ic} + \alpha P_{ic} + \xi_{ic}$$

For demand for DBS provider j in geographical area i: Eq. (2):[8]

$$\ln(Share_{ij} / AntennaShare_i) = \delta_{ij} + \alpha P_j + \sigma \ln(\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i}) + \xi_{ij}$$

where $Share_{ij}$ is the EchoStar or DIRECTV share of all households in geographical area i.

$\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i}$ is the ratio of the share of EchoStar or DIRECTV in geographical area i to the sum of those two shares (*i.e.*, it's the within-DBS nest share of EchoStar or DIRECTV). σ measures the strength of the DBS nest, and α drives the price elasticity of demand for all inside goods. Further, δ can be interpreted as the mean utility associated with measured product characteristics (gross of price). (δ_j in the share equations are equivalent to $x_j\beta$ in the utility equations above.) ξ, as before, may be interpreted as the

---

[7] See Berry (1994) for derivation.

[8] In a flat logit model, the DBS demand function is the same as in a nested logit model—except that the $\sigma \ln[\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i}]$ term drops out since $\sigma = 0$. The cable demand equation remains unchanged in a flat logit context and is the same as Eq. (1).

utility associated with unmeasured product characteristics in a given area. (For convenience, we suppress time subscripts above.) We need to estimate or calibrate $\{\alpha,\sigma,\delta,\xi\}$ to describe the logit demand system.

Assumptions about Cost

Each DBS operator's marginal cost is the same across cable franchise areas and changes only with merger efficiencies. Otherwise, they are constant, as are the different marginal costs of the cable operators in the different geographical areas.

Assumptions about Competition and Conduct

Firms choose prices to maximize static profits in a Bertrand model of differentiated product competition. Each cable operator chooses price for each local franchise area. Each DBS provider chooses its price nationally.

II. Estimation

Section I above specified a model of demand, cost, and conduct. The next step in the merger simulation process involves establishing the demand and cost parameters of the model by means of econometric estimation and calibration.

Estimating σ

Econometric determination of σ requires that we estimate the EchoStar and DIRECTV share equations (Eq. (2) above) with instruments for

$\ln(\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i})$ since this term is endogenous. Appropriate instruments would need to vary geographically such that they are correlated with

$\ln(\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i})$, but are not correlated with the error term, ξ_{ij}.

Following Berry (1994), measures of regional service quality of EchoStar (DIRECTV) constitute a potential set of instruments for the DIRECTV (EchoStar) share equation. However, both DBS firms offer national service with little (or no) geographical variation in service. One potential instrument – local-into-local ("LIL") service – was attempted. But since such LIL service covaries for EchoStar and DIRECTV – that is, they both offer LIL service in the biggest DMAs – this is not a very effective instrument. A two-stage least squares ("2SLS") estimation of Eq. (2) produced auxiliary regressions in which the instrument had an insignificant coefficient in the first stage of the 2SLS regression.

An alternative approach is to calibrate those parameters that cannot be estimated. The calibration may be based on direct observations that can be related to model parameters. For example, as described at the presentation on July 2nd, the parties conduct surveys that directly reveal diversion between the two DBS firms.[9] Starting from a known diversion ratio allows us to calibrate the model's nest parameter σ. Since the diversion ratio in the model is a function of σ, inverting this function allows us to solve for σ as shown below.

The diversion ratio from DIRECTV to EchoStar in the model is $\frac{\varepsilon_{ED} s_E}{\varepsilon_{DD} s_D}$, where ε_{ij} is the elasticity of demand for product i with respect to price of product j, s_i is the share of product i, and D and E signify DIRECTV and EchoStar, respectively.

Given the logit structure, the own and cross elasticities can be expressed

as:[10] $\varepsilon_{ED} = \alpha P_D(s_D + (\frac{\sigma}{1-\sigma})(\frac{s_D}{s_D + s_E}))$

[9] The "diversion ratio" from DIRECTV to EchoStar can be defined as the derivative of EchoStar demand with respect to DIRECTV price divided by the derivative of DIRECTV demand with respect to DIRECTV price. (For further details, see Shapiro (1996).)

[10] Slade (2002) lists elasticity functions in a nested logit model.

$$\varepsilon_{DD} = \alpha P_D (s_D - (\frac{1}{1-\sigma}) + (\frac{\sigma}{1-\sigma})(\frac{s_D}{s_D + s_E}))$$

Substituting the above expressions for own and cross elasticities into the diversion ratio expression, $\frac{\varepsilon_{ED} s_E}{\varepsilon_{DD} s_D}$, yields the diversion ratio as a function of s_D, s_E, σ. We can invert this function to get σ as a function of s_D, s_E and the diversion ratio. We observe s_D, s_E. Hence, we can solve for the value of σ that produces a given diversion ratio.[11]

Specifically, we find that a σ of zero (the flat logit case) corresponds to a diversion ratio of [ ] percent from DIRECTV to EchoStar. For a diversion ratio of [ ] percent from DIRECTV to EchoStar, the corresponding σ is [ ]. For a [ ] percent diversion ratio, the σ is [ ] and for a [ ] percent diversion ratio, the σ is [ ].

Note that the model overstates the strength of the nest (and therefore underestimates the benefits of the merger) in an important respect, as it implies a diversion ratio from EchoStar to DIRECTV that is higher by several percentage points than the diversion ratio from DIRECTV to EchoStar. Except in the flat logit case, the EchoStar-to-DIRECTV diversion ratio implied by the model is higher than what we observe in the EchoStar churn survey data. Adjusting the model to reflect the actual EchoStar-to-

[11] This solution for σ is correct for the case where there is only a single geographical area. When there are many local cable franchise areas (as is the case in our simulation), the above formula needs to slightly modified in predicting a nationwide diversion ratio. This is because the national elasticities and national diversion ratios are non-linear aggregations of individual area elasticities and diversion ratios. Addendum 2 contains details on how we adapt the single-area approach detailed above to the case where there are several geographical areas, thereby deriving a value of σ that is consistent with a given national average diversion ratio. The spreadsheet used to calculate the σ is in the file *Sigma_Calculator.xls*.

DIRECTV churn data in the record would make the estimated benefits of the merger even larger.[12]

Estimating α

Since there is limited cross-sectional and intertemporal variation in DBS prices and qualities, we cannot obtain reliable estimates of α from the two DBS share equations (Eq. (2)). Instead, we estimate α using the cable share equation (Eq. (1)). We rely on cable price variation to estimate α because cable fees show substantial variation—different cable operators levy significantly different fees in different franchise areas.

We define the relevant cable price variable based on the monthly basic fee reported by cable operators to Warren Communications (for January 2000, January 2001, and January 2002). This fee has been scaled up to reflect the average cable ARPU.[13] The use of a cable price "index" (*i.e.*, a weighted average of monthly basic fee, expanded basic fee and

[12] [

]

[13] We add a constant to each operating area's basic fee such that the average nationwide cable price equals the 2001 national cable ARPU of $[ ]. Note that adding a constant to the basic fee in each cable franchise area cannot change the estimated value of α.

HBO *a la carte* fee) was also explored and rejected because we could not find effective instruments for this index.[14]

Unlike traditional logit estimation methods using individual data, our formulation of the demand system here (following Berry (1994)) allows us to use instruments for the cable price variable. This instrumental variable method allows us to produce consistent estimates of price elasticities. As Goolsbee and Petrin (2002) have shown, uninstrumented Ordinary Least Squares ("OLS") regressions produce cable price elasticity estimates that are biased toward zero. The bias arises from the endogeneity of the price variable – that is, service quality does not remain constant as cable prices vary. (See Goolsbee and Petrin (2002) and Berry (1994).)

Following the widely used approach employed by Hausman, Leonard & Zona (1994) and Goolsbee and Petrin (2002), we use the average cable price charge in all other cable operating areas owned by the same MSO and the average price charged in all other operating areas in the same DMA as instruments for the cable price of a given operator. The idea is that cable areas owned by the same MSO and areas in the same DMA are likely to have common cost components.[15] These instruments perform well; they have strong predictive power in the first stage of the 2SLS estimations, and they yield negative and significant values for the price coefficient, α, whereas the non-instrumented approach often yielded insignificant or even positive coefficients on price.

[14] As instruments for this "index" we used variables similar to those that we used as instruments for the cable price variable based on the basic cable fee. However, the auxiliary regressions did not perform well, and α did not have the correct sign in 2SLS estimations.

[15] These instruments may be correlated with common demand factors as well as common cost factors. In that case, our estimate of α is biased upward and our estimates of MVPD elasticities are too low. If so, we over-estimate price increases following the merger.

We estimate the following version of the cable share Equation 1 using cable franchise area level data reported by Warren Communications for January 2000, January 2001 and January 2002.[16] (For convenience, we suppress the time subscript below.)

Eq. (1.1):

$$ln(CableShare\,/\,AntennaShare)_i = x_{ic}\beta + \alpha\, p_{ic} + \xi_{ic}$$

where x_{ic} is a vector of cable and demographic characteristics of area i. We populate this vector with the following variables:

-- Number of premium channels offered in each cable franchise area

-- Number of channels in use (*i.e.*, total number of channels) in each cable franchise area

-- Cable franchise area demographics: percentage of singles in population, average income, percentage of single unit dwellings, percentage of houses that are rented, average household size, log of population density

-- Year fixed effects

-- DMA size fixed effects

-- MSO size fixed effects

Some cable franchise areas offer only basic service – that is, the cable franchise does not offer expanded basic service. Others report offering both basic and expanded basic tiers. Since the definition of "basic fee" is different across these groups, we run regressions separately for both groups. The results from estimating the cable share equation (1.1) using a 2SLS estimation approach are described in Table 1. Based on the results displayed in Table 1, the weighted average coefficient on price (α) is [ ].

[16] The STATA programs used to calculate the results in Table 1 (and the log files generated, which contain summary statistics of all variables) were produced to the FCC on July 12th as part of the backup materials to the competitive effects presentation. The data used for these analyses were produced to the FCC on July 25th.

Calibrating δ and ξ

Finally, we extrapolate the model from observed cable franchise area data to consumer demand by calibrating average utilities to shares and prices. The parameter δ specifies the average utility (gross of price) associated with measured product characteristics for each product in each cable franchise area. A higher δ for cable in a given cable franchise area, for example, implies a higher share, *ceteris paribus*. Likewise, ξ may be interpreted as the utility associated with unmeasured product quality characteristics. For the purpose of simulating the merger, we do not need to identify these two effects separately. Instead, since both terms enter a consumer's utility additively, it is sufficient to identify $\delta + \xi$ for each product in each cable franchise area.

$\delta + \xi$ for each product in each cable franchise area is calibrated so that the share of each product in each area as predicted by the logit model equals the observed share. In other words, at this stage we have the values of all parameters and variables for Equations (1) and (2) for cable, DIRECTV and EchoStar for each area—except for $\delta + \xi$. We then set $\delta + \xi$ such that equations (1) and (2) are satisfied. For example, take Equation 1, the cable share equation:

$$\ln(CableShare / AntennaShare)_i = \delta_{ic} + \alpha P_{ic} + \xi_{ic}$$

In the above equation, we observe the left-hand-side variables since we observe cable shares in each franchise area. We also know αP_{ic} since we have estimated α and we observe the cable fee variable, P_{ic}. Hence, we can solve for the value of $\delta + \xi$ for cable in each area.

Likewise, we can solve for the values of $\delta + \xi$ corresponding to the two DBS firms using a similar approach with Equation (2) below:

$$\ln(Share_{ij} / AntennaShare_i) = \delta_{ij} + \alpha P_j + \sigma \ln(\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i}) + \xi_{ij}$$

As with the cable share equation, we can solve for the values of $\delta + \xi$ corresponding to the two DBS firms since we observe the left hand side of the above equation, αP_{ic}, and we know

$\sigma \ln(\frac{Share_{ij}}{EchoStarShare_i + DIRECTVShare_i})$ once σ is calibrated.[17]

The solution for $\delta + \xi$ for a product in each area is unique – given shares, prices, and the estimates of the other parameters derived above. The values of $\delta + \xi$ for each product in each cable franchise area are calculated by the Mathematica program (**_Simulation.nb*) that we use to simulate the merger. The actual values of $\delta + \xi$ in each cable franchise area are listed in the **_Output_MC_*.csv* files produced by the Mathematica program.[18]

Estimating Marginal Costs

We derive marginal costs from first order conditions for each firm's profit maximization. Since we now have a fully specified demand function, we can derive the own-price elasticity of demand for each product in each franchise area at current prices and shares. Assuming Bertrand-Nash competition, the Lerner Condition then implies cable firms' marginal costs. Specifically, we use the following Lerner Condition to solve for cable marginal cost in each area:

$$\frac{P_{ic} - MC_{ic}}{P_{ic}} = \frac{1}{\varepsilon_{ic}}$$

[17] DBS "price" here refers to the DBS firms' 2001 ARPU plus equipment costs. Equipment costs equal $[ ] for DIRECTV and $[ ] for EchoStar. These equipment costs are amortized over a year. The resulting price is $[ ] per month for DIRECTV and $[ ] for EchoStar. (Sources of these and other data used in our analysis are listed in the Sources Tab of the *Welfare_Spreadsheet.xls* files).

[18] Details of the Mathematica programs and the output files produced by these programs are in Addendum 4.

We can solve for MC_{ic}, the marginal cost of the cable operator in area i, from the above equality since we observe P_{ic} and we can calculate ε_{ic} (the own elasticity of demand for cable in area i) since we now have values for all parameters in the logit system. Likewise, we can solve for the marginal costs of the two DBS providers. The only difference is that the price and marginal cost of each DBS provider are constant across all cable franchise areas and it is the elasticity of national demand for each product that is pertinent.

The values of marginal costs for each product are calculated by the Mathematica program (**_Simulation.nb*) that we use to simulate the merger. Values of marginal costs of cable in each franchise area and of the two DBS providers are listed in **_Output_MC_*.csv* files produced by the Mathematica programs that we use to simulate the merger.[19]

Some Comparisons with the MVPD Literature

University of Chicago economists Austan Goolsbee and Amil Petrin (Goolsbee and Petrin 2002) find in a recent paper that the own-price elasticity of demand for DBS is between [ ] and [ ], and the own-price elasticity of demand for expanded basic cable service is between [ ] and [ ]. Crawford (2000) finds that the own-price elasticity of basic cable demand is [ ]. Consistent with these estimates from the extant literature, our nested logit model predicts (conditional on prices and shares comparable to those used in Goolsbee and Petrin (2002)) that DIRECTV's own-price elasticity is [ ], EchoStar's own-price elasticity is [ ], and the own-price elasticity of demand for basic cable is [ ].[20]

Second, it is noteworthy that Forrester Technographics survey data show that there is no difference in the distribution of income across households that subscribe to cable, EchoStar and DIRECTV. This is consistent with our logit formulation in which α (the marginal utility of income) is uniform across the populations that subscribe to the three

[19] Details of the Mathematica programs and the output files produced by these programs are in Addendum 4.

MVPD services. It also suggests that a random coefficients logit model is unlikely to produce improved estimates.

[20] In order meaningfully to compare the elasticities produced by our model and those by Goolsbee and Petrin (2002), we calculated elasticities based on the nested logit model using the same prices and shares as Goolsbee and Petrin. (To match Goolsbee and Petrin, we use January 2000 national market shares as the best available approximation; Goolsbee and Petrin use 1999 data.) Specifically, we use the following monthly prices: cable: $[ ]; DIRECTV and EchoStar: $[ ]. We use the following national shares: cable: [ ] percent; DIRECTV: [ ] percent; EchoStar: [ ] percent. We assume a single national market. Using the Mathematica program **_Simulation.nb* (the same Mathematica program as for the rest of the simulations), we calculate the elasticities of the two DBS providers and of cable. Also, we use a [ ] percent diversion ratio from DIRECTV to EchoStar (*i.e.*, a calibrated value of σ of [ ]).

SECTION 2: SIMULATING THE EFFECTS OF THE MERGER ON PRICES

The first section of this paper specifies our model of demand and competition, and details how the demand and cost parameters were estimated and calibrated. This section explicates how we simulate the price effects of the merger by solving for post-merger prices of EchoStar and DIRECTV that maximize the joint profits of the two firms (given the demand and cost parameters produced in Step 1 described in the previous section). Cable prices post merger are derived by calculating the cable price in each franchise area that maximizes cable profits given the national price of EchoStar and of DIRECTV. Thus, we solve for a vector of prices that simultaneously satisfy all the Bertrand-Nash equilibrium conditions.

We derive the equilibrium prices by solving a system of equations that consist of the First Order Conditions ("FOCs") for the profit maximizations of the inside goods. If there are N cable franchise areas then, following the merger, there are N+1 profit maximizations by N+1 firms and N+2 FOCs for the N+2 prices.

Specifically, let $p_i = \{p^{DTV}, p^{ECHO}, p_i^{CABLE}\}$ be a vector of prices in franchise area i. Define (logit) demand in area i to be $q_i^j(p_i, \delta_i, \xi_i, \sigma)$. Let $\{c^{DTV}, c^{ECHO}, c_i^{CABLE}\}$ be the marginal costs of each firm. Given N areas, we solve the following $N+1$ simultaneous profit-maximizations (for convenience, we suppress all arguments of $q_i^j(p_i, \delta_i, \xi_i, \sigma)$ other than price):

$$\max_{p^{DTV}, p^{ECHO}} \sum_{i=1}^{N} [q_i^{DTV}(p_i)(p^{DTV} - c^{DTV}) + q_i^{ES}(p_i)(p^{ES} - c^{ES})]$$

$$\max_{p_i^{CABLE}} q_i^{CABLE}(p_i)(p_i^{CABLE} - c_i^{CABLE}),\ i \in \{1, \ldots, N\}$$

Solving the FOCs implied by the above profit maximizations yields post-merger prices. We solve the system of FOC equations using January 2002 data on cable franchise areas. We have 4,984 cable operating areas with complete information as of January 2002. The cable franchises in our data account for approximately 75 percent of all households nationwide. In addition, we account for the population in zip codes that are outside cable franchise areas by creating an additional "uncabled area." Our data show that uncabled zip codes have approximately [ ] households.[21] We pool all these households into a single "uncabled area." Using these 4,985 areas, we solve the system of equations described above to derive post-merger prices and the welfare changes stemming from these price changes.

The system of equations was solved using a Mathematica program (in **_Simulation.nb*). A description of this program and instructions on how to use it are in Addendum 4. The program generates output files (one for each marginal cost scenario) that contain the following post-merger variables for each cable area: cable prices, DIRECTV and EchoStar prices (nationwide), shares of cable, DIRECTV, EchoStar and antenna, and consumer welfare changes. The output files containing these fields are titled **_Output_MC_*.csv*.

[21] Uncabled zip codes are difficult to identify accurately. An alternative list of uncabled zip codes in our data indicates a lower count of households in such areas. We pick the higher count in order to be conservative.

SECTION 3: ESTIMATING THE EFFECTS OF MERGER-SPECIFIC EFFICIENCIES

In this section, we describe the final step in the merger simulation; *i.e.*, quantifying the consumer welfare effects of two types of merger-specific efficiencies: reduced DBS marginal costs and the expansion of local service following the merger.[22]

I. Marginal Cost Reductions

As a result of the merger, marginal costs of DBS are expected to decrease. While the merger will likely produce other cost reductions, our analysis concentrates on the marginal cost reductions due to reduced programming costs and subscriber acquisition costs (SAC). In our simulation analysis, we rely on a range of conservative cost reduction scenarios and simulate the effects of each scenario on consumer welfare. The specific dollar amounts of the marginal cost reductions that we employ are listed in the table below. Any reduction in marginal costs generates consumer welfare improvements by reducing the equilibrium DIRECTV and EchoStar post-merger prices, and also the equilibrium cable price. (In the rest of this section, "price" refers to monthly ARPU for cable and ARPU plus equipment cost amortized over a year for the two DBS providers.) We incorporate the marginal cost reductions in our merger simulation by assuming that the marginal cost of each DBS firm drops by the dollar amount listed under each scenario, and then calculating the equilibrium post-merger prices given the new, lower marginal costs.

	[redacted]			
	A	B	C	D
EchoStar	$[ ]	$[ ]	$[ ]	$[ ]
DIRECTV	$[ ]	$[ ]	$[ ]	$[ ]

The reasons for these marginal cost reductions were detailed at both the competitive effects presentation on July 2nd, 2002 and the synergies presentation on July 3rd, 2002.

[22] We used a Mathematica program to calculate the price and welfare effects of marginal cost reductions. The welfare effects of LIL expansion were calculated using a spreadsheet. Details regarding both sets of files and how to use them are in Addendum 4.

The reduction in marginal cost is incorporated into the simulation analysis by keying in the dollar value of the cost reduction into §1 Step A of the Mathematica program in •*_Simulation.nb*. The program then calculates the post-merger prices, etc. using the lower marginal costs for DIRECTV and EchoStar.

II. Welfare Effects of Expanded Local-into-Local Service

The merger will allow New EchoStar to expand LIL service to all 210 DMAs. The simulation is based on the conclusion that absent the merger, DMAs ranked 71-210 would likely not receive LIL service, whereas with the merger, both DIRECTV and EchoStar introduce LIL in these DMAs.[23] Such an expansion of LIL service increases consumer welfare in these DMAs in at least two ways; first, by an increase in consumer utility derived from the improved service (the "direct effect"), and second by a reduction of cable prices in response to the improved DBS service (the "indirect effect"). Each of these components is described below.

Before discussing our methodology in further detail, we add the following notes regarding how we implement our approach. First, we do not calculate area by area the welfare change from expanded LIL service (the direct and the indirect effects). Instead, we calculate the total LIL related increase in welfare in all DMAs ranked 71-210 combined. Second, the actual calculations of LIL related welfare improvements are implemented in the spreadsheet titled *_Welfare_Spreadsheet.xls*. These files are described in detail in Addendum 4. The precise formulas and data used in each step of the process of calculating the welfare effects of LIL can be seen in *_Welfare_Spreadsheet.xls*. In other words, the *_Welfare_Spreadsheet.xls* files contain all the numbers and formulas needed to illustrate precisely how we used the parameter estimates from the LIL regressions in Table 2 (which is

[23] See Willig Reply Declaration, February 25, 2002, at ¶¶ 9-17.